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Dust as a Carrier of Disease in the Schoolroom

By

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THE days of duelling and cruel warfare are fast passing away. The conservation of human health and happiness is beginning to receive due consideration.

The national government has put itself on record as favoring the preservation of its national wealth by instituting measures to prevent disease, maintain health and prolong the life of its citizens.

One and a half million of our citizens die annually, and authorities on hygiene agree that a quarter-million of these lives are sacrifices to the gods of ignorance, carelessness and avarice.

Science has hunted down the weapons of disease and made clear how victory over death may often be won. The discoveries of Koch, Pasteur and others have made impossible such a tidal wave of death as swept the entire known world a score of times in the past during the christian era. Cholera, yellow fever and the bubonic plague no longer decimate armies or destroy fleets, because the abiding place of the germs of these diseases has been discovered and their destruction speedily accomplished.



Fig 1. Louis Pasteur, the world's greatest benefactor in showing how to prevent disease.



Fig. 2. Robert Koch, the discoverer of the germ of tuberculosis which is able to live more than a year in school-room dust.

The germ diseases cause more than a half million deaths yearly, and yet they are known to be preventable diseases. Diphtheria attacks the child only when the microscopic diphtheria plant enters its mouth with dust or otherwise. Consumption and pneumonia are merely conditions of ill health caused by the special germs of those diseases growing in the body and giving off their poisons. The only sure method of preventing any of these diseases is to prevent the germs from entering the body. Thieves cannot rob a house and slay the occupants until they have gained entrance. Germs cannot destroy the life until they have made their way into the human system.

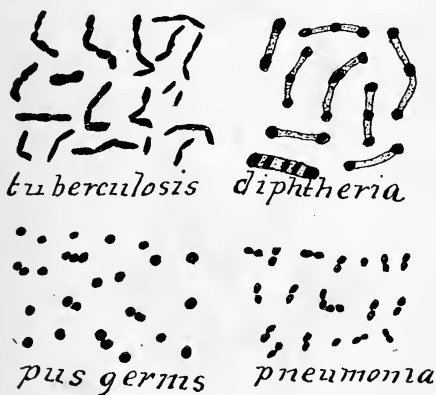


Fig. 3. Some of the disease germs which have been found in dust.

Most disease germs reach their victims with air or food. With care, pure food may generally be obtained, but absolutely pure air is seldom found. Investigations have shown, however, that air free of dust is almost or quite free of disease germs. Moreover since sunshine is a great germ killer, out-of-door dust contains only one-tenth as many disease germs as in-door dust. One way then of preventing disease is to prevent the dust from permeating the air within buildings.

Doctor Abbott of the University of Pennsylvania, in his *Hygiene of Transmissible Disease* says: "Aside from its irritating influence dust may, and often does, serve as a direct carrier of infection." Sedgwick's *Principles of Sanitary Science and Public Health* refers to the dangers of dust as follows: "It still remains true that dust must always be regarded by the sanitarian as dangerous, not only because of the mechanical irritation of the delicate mucous membrane of the throat and other respiratory passages caused by the inorganic particles of which it is largely composed, but also because of the possibility of its containing virulent germs of disease, such as those of tuberculosis or diphtheria from the sputum of persons affected with these maladies; as well as those of smallpox, scarlet fever, measles and the like."

Cases reported by the Public Health and Marine Hospital Service for the six largest cities of the U.S. 1908.



Fig. 4. Chart showing that the number of cases of scarlet fever and diphtheria are greatly increased when the schools are in session.

Since the young are more susceptible to disease than older persons it is of special importance that playrooms and school buildings should be kept free of dust. Two months after the opening of the schools in the fall, the number of cases of diphtheria and scarlet fever is doubled among school children where no effort is made to avoid dust in cleaning. Every year contagious diseases appeared in the Upsala Street School at Worcester, Mass., until 1900-1901. During that entire nine months of school, care was taken to avoid causing dust in the rooms, and as a result not a single case of contagious disease occurred among the 425 pupils. Truly to prevent dust is to prevent disease.



Fig. 5. A ten-year-old school boy in whose left tonsil was found thousands of tubercle bacilli.

Evidence is constantly accumulating to show that the germs which cause tuberculosis resulting in one-third of all deaths occurring between the ages of fifteen and thirty years find their way into the system during school days. Henry B. Jacobs, M. D., in his article on the prevention of Tuberculosis among School Children, published in Vol. V of The Journal of Outdoor Life says: "It is safe to say, perhaps, that in every case of tuberculosis, the infection occurred from two to ten years before its final manifestation. This being so, the cases of consumption, which begin to be numerous after the fifteenth year of life, must have had their inception, their infection, within the school days." Such statements as this coming from a scientist of high standing lead anxious parents and alert school authorities to ask how these tiny agents of death find their way to the lungs and other organs of their victim.

In every city of 80,000 inhabitants there are at least 1,000 persons with tuberculosis. The average number of germs cast out in the sputum of each sufferer is not less than 1,000,000 daily. Some of this germ-laden sputum is cast upon the sidewalk, and sticking to the shoes of passing children finds its way into the school room. In some places it is certain that in this manner thousands of tubercular germs are carried daily into the school building. The experiments of Cornet, Klein and others have demonstrated that these deadly germs may continue to live there for weeks and even months.



Fig. 6. Dishes of pure meat jelly which were left open two minutes in a school room being swept. Wherever a germ dropped it grew in three days to form a colony appearing as a white spot.

So long as the germs remain on the floor, no harm results, but the janitor in his daily sweeping distributes them over the books and desks. The children after touching these objects put their fingers into their mouths or noses and thus in a single minute may transfer a score or more of tubercular germs to the nursery grounds formed by decayed teeth and enlarged tonsils. By placing the finger on a desk not well dusted and then touching the finger to a moistened glass slide as it might have been touched to the mouth, I have been able to demonstrate the presence of over a thousand germs of various kinds clinging to the tip of the finger.

Moreover, the janitor in sweeping scatters the germ-bearing dust through the air and thus causes myriads of germs to later drop upon the floor as is shown by the accompanying illustrations.

By catching the germs dropping to the floor during sweeping, in dishes of pure meat jelly, I have been able to show that in the cleaning of an ordinary school room more than 10,000,000 germs fell to the floor every two minutes. These germs are being constantly stirred up during the day by the tramp of the feet and the currents produced by the swinging of the skirts so that the air of the room is more or less charged with whatever germs are distributed over the floor. Sternberg's Bacteriology records the average number of bacteria in each cubic yard of air in school rooms examined by Ruete and Enoch as 250,000. Fortunately, however, but a small part of these are of the disease-producing class. The fact, nevertheless, that the germs of tuberculosis have often been found in dust, makes it evident that the children are likely to breathe some disease germs into their mouths when living several hours daily in a dusty room.

The tubercular germ when once in the mouth can easily make its way through the soft enlarged tonsils into the blood or lymph vessels and then be carried to the lungs or elsewhere to grow later and produce tuberculosis.

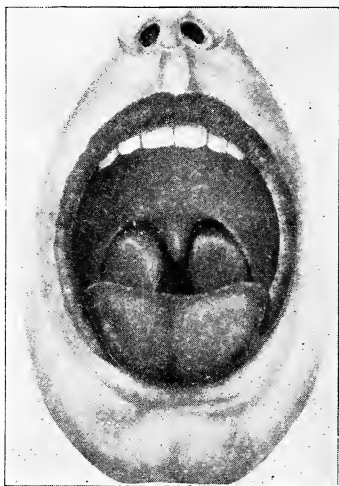


Fig. 7. An exact drawing of the enlarged tonsils in a ten-year-old schoolboy, one of which contained many tubercle bacilli.

Of 78,000 school children recently examined in New York City, more than 18,000 had enlarged tonsils giving easy access to the disease germs. Among these same school children over 35,000 were found with enlarged glands in the neck which in many cases were due to tubercular germs growing there after they had found their way from the mouth through the tonsils and down the lymph vessels.



Fig. 8. Eleven-year-old school boy with an enlarged gland at the side of the neck caused by germs of tuberculosis.

Dr. T. Mitchell Prudden of the College of Physicians and Surgeons in New York in his admirable book on Dust and its Dangers says: "More proof than is in our hands is hardly needed that in a very large proportion of cases in inhabited regions, the infection or germ of tuberculosis is conveyed from sick to well persons by means of the material discharged from the lungs, which is allowed from carelessness or ignorance, to dry and finally mingle with the floating dust."

If the germs of tuberculosis are so common in the dust as late investigations seem to show, some persons ask "why do not more of the children become infected?" The reply is that a great many more become infected than actually suffer from the disease. The bodies of three out of every four persons dying after the school age of other causes than consumption, when examined carefully are found to have growths of tubercle bacilli in them somewhere. Von Behring in his recent book on the Suppression of Tuberculosis says: "Dr. Naegeli of Zurich, working under the direction of Prof. Ribbert, was unable to discover at autopsy a single body over thirty years old in which there were not some signs of the occurrence of a tubercular infection."

One-third of all deaths occurring within fifteen years after the average age at which pupils quit school, result from tuberculosis. Four hundred persons die daily of this malady alone in the United States. "The reason why consumption is so widespread," says Doctor Prudden, "is

simply that consumptive persons, either from ignorance or carelessness, are distributing the poison not only everywhere they go but everywhere the dust goes."

That the specific agents of diphtheria, tonsillitis, scarlet fever and perhaps other diseases lurk in the school room dust there is little doubt, but further demonstrations of the evils arising from dust permitted to accumulate in rooms where the young are confined several hours daily is unnecessary.

In the great twentieth century fight now going on against disease, the opinion that dust must be banished whenever and wherever possible is unanimous. Health authorities have denounced dry sweeping and the after-use of the feather duster, scattering showers of death-laden dust from one end of the room to the other, as little less than criminal carelessness.

The dust evil may be much mitigated in various ways with little trouble and expense. In some schoolrooms, damp sawdust is sprinkled over the floors to allay the dust, while in others the floor is oiled bi-monthly. Of these two methods, the use of sawdust is preferable. The one chief objection to the oil is that it soils dresses, and the other that it fails to hold fast many of the germ-bearing dust particles after a fortnight's application. Some janitors refuse to use sawdust because of the large amount required and the difficulty of keeping it in a proper moist condition. The latter may be largely overcome by a little patient experience.

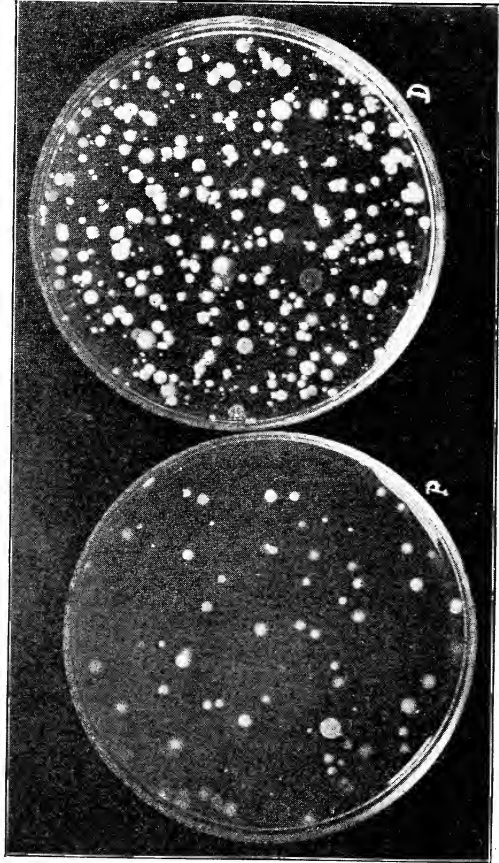


Fig 9. Photograph of two plates of pure meat jelly. P was left open four minutes in the school room being swept with the use of Perolin. D was left open four minutes in the same room the next day while it was being swept dry. The spots show where germs fell on the plates and grew.

As a substitute for the oil dressings and moist sawdust there has recently been placed on the market a product called Perolin, the invention of Dr. Sandor Brick, an eminent German chemist, which when swept over the floor *absorbs* in a large degree dust particles, great and small. The cheapness of the product and its effectiveness in keeping down the dust commend it to all members of the health brigade. By bacterial cultures, I have been able to demonstrate that in the sweeping of an ordinary school room, the Perolin used was able to catch and hold at least more than 100,000,000 germs. The use of a damp cloth instead of a dry rag or feather duster in cleansing the desks still further reduces the germ content of the room and renders it quite or entirely sanitary.

The riches and blessing which are sure to come from adopting the proper measures to maintain health are tersely stated in the January number of *American Health* in the following words: "What might be accomplished by a determined effort to conserve human life, has been estimated for the Conservation Commission by one of its members, Professor Irving Fisher, of Yale University. By the aid of eighteen medical experts, he has calculated that the prevention, even in a moderate degree, of the preventable diseases, would lengthen human life in this country fully one-third and possibly much more."

In India where sanitary living is disregarded the average length of human life is twenty-five years, while in our own country sanitation and the assistance of faithful physicians has increased the average length of life from thirty-five years in 1850 to forty-five years in 1905. Pure air, pure food and pure water are the necessities of healthful living, but the greatest of these is pure air.

Easton, Pa., April 10, 1909.







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